

References

1. Jones RB. Use of smokeless tobacco in the 1986 World Series. *N Engl J Med*. 1986;316:952. Letter.
2. Connolly GN, Orleans CT, Kogan M. Use of smokeless tobacco in major league baseball. *N Engl J Med*. 1988;318:1281-1285.
3. Orleans CT, Connolly GN, Workman S. *Beat the Smokeless Habit*. 2nd ed. Bethesda, Md: National Cancer Institute; 1992. DHHS publication NIH 92-3270.
4. Connolly GN, Orleans CT, Blum A. Snuffing tobacco out of sport. *Am J Public Health*. 1992;82:351-353.
5. Greene JC, Walsh MM, Masouredis C. A program to help major league baseball players quit using spit tobacco. *J Am Dent Assoc*. 1994;125:559-568.
6. Sussman S, Barovich M. Smokeless tobacco: less seen at 1988 World Series. *Am J Public Health*. 1989;79:521-522.

Excess Mortality in Smokeless Tobacco Users Not Meaningful

In a recent study, Bolinder et al. reported that Swedish construction workers aged 35 through 54 who use smokeless tobacco have higher mortality from cardiovascular diseases and from all causes than do workers who use no form of tobacco.¹ Excess deaths from all causes ($n = 50$) in these smokeless tobacco users are only partly attributable to excess cardiovascular disease deaths ($n = 23$) and other specific causes. In addition, no excess mortality from any cause was seen in older (aged 55 through 64) smokeless tobacco users. The broad spectrum of fatal "effects" and the striking age specificity do not seem explicable to us in biological terms.

There is a reasonable nonbiological explanation for the apparent excess of cardiovascular and all-cause deaths in young smokeless tobacco users: it is that members of the comparison group, nonusers of tobacco, are exceptionally healthy. We used Swedish population distribution² and mortality statistics³ to estimate the

number of deaths that would have occurred in smokeless tobacco users and nonusers aged 35 through 54 if they died at the same rate as the general Swedish male population over the same period.

Nonusers have substantially and identically lower risks of death from cardiovascular diseases and from all other causes (Table 1). In addition, young smokeless tobacco users have essentially no increased mortality when compared with the general population. In further support of this, a recent case-control study from Sweden showed no risk for myocardial infarction in daily snuff users aged 35 through 64.⁴

The question is, which is the appropriate control group for smokeless tobacco users, construction workers who are nonusers of tobacco or the general population? In favor of the first group is the fact that in some respects they are similar to the smokeless tobacco users. However, the nonusers are selected for a major determinant of health, non-smoking. They are thus a health-conscious group that probably practices many health-maintaining behaviors. We suggest that the unselected general population is the appropriate comparison group for smokeless tobacco users. From that perspective smokeless tobacco users have no meaningful excess mortality. □

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References

1. Bolinder G, Alfredsson L, Englund A, and de Faire U. Smokeless tobacco use and increased cardiovascular mortality among Swedish construction workers. *Am J Public Health*. 1994;84:399-404.

2. Bos E, Vu MT, Levin A, Bulato RA. *World Population Projections 1992-93 Edition: Estimates and Projections with Related Demographic Statistics*. Baltimore, Md: Johns Hopkins University Press; 1992.
3. *World Health Statistics Annual*. Geneva, Switzerland: World Health Organization; 1993.
4. Huhtasaari F, Asplund K, Lundberg V, Stegmayr B, Wester PO. Tobacco and myocardial infarction: is snuff less dangerous than cigarettes? *BMJ*. 1992;305:1252-1256.

Bolinder and Alfredsson Respond

When you are performing etiological research to quantitate the relationship between exposure and disease, according to scientific standards you have to study the relationship within a defined study base. After defining the base and assessing the exposure status of the study subjects, you compare the exposed subjects with the unexposed subjects concerning disease outcome. The ideal comparison group should resemble the exposed group in all respects except for the exposure. The validity of the study depends on potential bias due to selection, misclassification of exposure and disease, and/or confounding.

In our study we defined the study base as a group of construction workers examined between 1971 and 1974 and followed for deaths until 1985. Having classified the study population with regard to exposure, we compared the smokeless tobacco users with subjects who had never used tobacco with regard to cardiovascular mortality. In the analysis, adjustments were made for potential confounding factors such as age, residence, body mass index, blood pressure, and previous heart disease. We have discussed and evaluated the possible bias due to selection and misclassification.

Rodu and Cole suggest that a more appropriate group to compare with the smokeless tobacco users would be the general population in Sweden. We find it hard to see a valid argument for this suggestion. From studies within the realm of occupational medicine, it is well known that employed subjects have better health status than the general population, which incorporates healthy as well as unhealthy subjects ("the healthy worker effect"). It is evident that there is a health-related selection in and out of construction work, as illustrated by Rodu and Cole's table.

An important question is whether these selection mechanisms apply equally

TABLE 1—Mortality in Swedish Construction Workers Aged 35 through 54

	Cardiovascular			All Other Causes			All Causes		
	O	E	SMR	O	E	SMR	O	E	SMR
Nonusers	154	315	49	256	520	49	410	835	49
ST users	44	38	116	61	63	97	105	101	104

Note. O = deaths observed by Bolinder et al.; E = deaths expected from general population rates; SMR = standardized mortality ratio; ST = smokeless tobacco.